Appendix D – LEED Narrative and Somerville Sustainability Questionnaire

2022

350 Assembly Row – Block B7A, Somerville MA

GREEN BUILDING REPORT

FEBRUARY 10, 2022

Table of Contents

Executive Summary

This section includes an overview of the sustainable approach used at the proposed new building at 350 Assembly Row - Block B7A (the "Project"). The Project's goal is to achieve LEED CS-V4 Gold and comply with Somerville Zoning Ordinances.

Pursuant to Section 7.4.3.c of the December 2019 Somerville Zoning Ordinance (the "Current SZO"), development "subject to a previously approved Planned Unit Development (PUD) Preliminary Master Plan may be developed in accordance with the provisions of the Somerville Zoning Ordinance in effect as of August 1, 2019" (the "Former SZO"). As the larger Assembly Row development is subject to the approved PUD-PMP, the Project is being developed in accordance with the entirety of the Former SZO, including among other provisions, Section 5.2 (Special Permits with Site Plan Review ("SPSR-A"), Section 6.4 (Assembly Square Mixed-Use District ("ASMD") and Article 16 (Planned Unit Developments). The Proponent is submitting this Green Report and its associated appendices as a good faith effort to reduce impacts of energy usage and costs and minimize environmental impacts and waste; however, the Project is not required to prepare or submit the Green Report pursuant to the applicable Former Zoning.

The following pages describe the Project's intended approach to achieving LEED Gold certification. In addition, the attached Sustainaville Form with supporting diagrams and pre-submittal load assessment are provided to be consistent with the new process as additional information.

Section 1- LEED Checklist

LEED v4 for BD+C: Core & Shell
Project Checklist

Project Name: 350 Assembly Row - B7A
Date: 02/10/2022

Y	Y?	N?	N			
1	0	0	0	Credit	Integrative Process	1
17	**3**	**0**	**0**		**Location and Transportation**	**20**
0	0	0	0	Credit 1	LEED for Neighborhood Development Location	16
2	0	0	0	Credit 2	Sensitive Land Protection	1
3	0	0	0	Credit 3	High Priority Site	2
6	0	0	0	Credit 4	Surrounding Density and Diverse Uses	6
3	3	0	0	Credit 5	Access to Quality Transit	6
1	0	0	0	Credit 6	Bicycle Facilities	1
1	0	0	0	Credit 7	Reduced Parking Footprint	1
1	0	0	0	Credit 8	Green Vehicles	1
3	**1**	**2**	**5**		**Sustainable Sites**	**11**
Y				Prereq 1	Construction Activity Pollution Prevention	Required
1	0	0	0	Credit 1	Site Assessment	1
0	0	0	2	Credit 2	Site Development - Protect or Restore Habitat	2
0	0	0	1	Credit 3	Open Space	1
0	0	1	2	Credit 4	Rainwater Management	3
1	0	1	0	Credit 5	Heat Island Reduction	2
0	1	0	0	Credit 6	Light Pollution Reduction	1
1	0	0	0	Credit 7	Tenant Design and Construction Guidelines	1
8	**0**	**1**	**2**		**Water Efficiency**	**11**
Y				Prereq 1	Outdoor Water Use Reduction	Required
Y				Prereq 2	Indoor Water Use Reduction	Required
Y				Prereq 3	Building-Level Water Metering	Required
2	0	0	0	Credit 1	Outdoor Water Use Reduction	2
5	0	0	1	Credit 2	Indoor Water Use Reduction	6
0	0	1	1	Credit 3	Cooling Tower Water Use	2
1	0	0	0	Credit 4	Water Metering	1
14	**4**	**3**	**12**		**Energy and Atmosphere**	**33**
Y				Prereq 1	Fundamental Commissioning and Verification	Required
Y				Prereq 2	Minimum Energy Performance	Required
Y				Prereq 3	Building-Level Energy Metering	Required
Y				Prereq 4	Fundamental Refrigerant Management	Required
5	0	1	0	Credit 1	Enhanced Commissioning	6
8	2	2	6	Credit 2	Optimize Energy Performance	18
0	0	0	1	Credit 3	Advanced Energy Metering	1
0	0	0	2	Credit 4	Demand Response	2
0	0	0	3	Credit 5	Renewable Energy Production	3
1	0	0	0	Credit 6	Enhanced Refrigerant Management	1
0	2	0	0	Credit 7	Green Power and Carbon Offsets	2

Y	Y?	N?	N			
6	**2**	**0**	**6**		**Materials and Resources**	**14**
Y				Prereq 1	Storage and Collection of Recyclables	Required
Y				Prereq 2	Construction and Demolition Waste Management Planning	Required
1	1	0	4	Credit 1	Building Life-Cycle Impact Reduction	6
1	0	0	1	Credit 2	Building Product Disclosure and Optimization - Environmental Product Declarations	2
1	1	0	0	Credit 3	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	0	0	1	Credit 4	Building Product Disclosure and Optimization - Material Ingredients	2
2	0	0	0	Credit 5	Construction and Demolition Waste Management	2
6	**2**	**1**	**1**		**Indoor Environmental Quality**	**10**
Y				Prereq 1	Minimum Indoor Air Quality Performance	Required
Y				Prereq 2	Environmental Tobacco Smoke Control	Required
2	0	0	0	Credit 1	Enhanced Indoor Air Quality Strategies	2
2	1	0	0	Credit 2	Low-Emitting Materials	3
1	0	0	0	Credit 3	Construction Indoor Air Quality Management Plan	1
0	1	1	1	Credit 4	Daylight	3
1	0	0	0	Credit 5	Quality Views	1
6	**0**	**0**	**0**		**Innovation**	**6**
5	0	0	0	Credit 1	Innovation	5
1	0	0	0	Credit 2	LEED Accredited Professional	1
3	**0**	**1**	**0**		**Regional Priority**	**4**
0	0	1	0	Credit 1	Regional Priority: Building Life-Cycle Reduction / Rainwater Management	1
1	0	0	0	Credit 2	Regional Priority: Indoor Water Use Reduction	1
1	0	0	0	Credit 3	Regional Priority: High Priority Site	1
1	0	0	0	Credit 4	Regional Priority: Optimize Energy Performance	1
64	**12**	**8**	**26**		**TOTALS**	Possible Points: **110**

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

Section 2- LEED Summary

LEED Information

is a core and shell construction project, will be registered with the U.S. Green Building Council under the LEED v4 Building Design + Construction for Core & Shell projects, and is targeting LEED Gold Certification.

The team is reviewing the building's performance potential under the new LEED V4 rating system. The below narrative documents an analysis of the LEED V4 prerequisites and credits and identifies which the building is pursuing to reach a target of LEED Gold Certification under the new rating system and includes considerations for LEED v4.1 credit pursuit where appropriate.

I, Jyothsna Giridhar, LEED AP BD+C, have reviewed the project in conjunction with the design team members, and together, we developed the narrative and supporting documentation provided herein. I confirm that the project shows sufficient potential to reach a minimum of Gold level certification with at least 64 verifiable points and an additional 4 to 12 likely points as required by the Somerville Zoning Ordinance (see Section 1 for the LEED scorecard). This shall be accomplished through various qualities attributed to both the project context, as well as its design merits and client initiatives.

Integrative Process

During the preliminary design phases, the team studied site conditions, basic envelope attributes, energy-related systems, and water-related systems to identify potential synergies across disciplines and building systems. These studies have been used to inform the Owner's project requirements and the design documents and will be summarized in the Integrative Process worksheet provided by the USGBC.

Location and Transportation

LTC2 Sensitive Land Protection

The project is developed on an existing parking lot. This falls under the definition of previously developed site and qualifies for the credit.

LTC3 High Priority Site

The project is in an area considered to be a 2022 Difficult to Develop Area (DDA) per the Housing and Urban Development website: https://www.huduser.gov/portal/sadda/sadda_qct.html, thus qualifying for Option 2 for two points. Additionally, soils and groundwater contamination has been identified on site, which will be remediated, also qualifying the project for three points under Option 3.

LTC4 Surrounding Density and Diverse Uses

The project site is in a dense urban Somerville neighborhood, was previously developed, is adjacent to residential areas, and is close to many basic services, all connected with pedestrian and bicycle access. The project is pursuing six points under both Options 1 and 2.

LTC5 Access to Quality Transit

350 Assembly Row - Block 7A is 0.25 miles from the Assembly Subway station which is served by the Orange line. The project is also within 0.25 miles from bus stops at Grand Union Boulevard Foley Street and Mystic Avenue at Middlesex Avenue that are served by buses 90 and 95. The two bus lines and the subway provide 186 stops per weekday, and 116 stops per weekend. Under v4.1 updated requirements; the project is eligible for 3 points.

LTC6 Bicycle Facilities

The project is located adjacent to an existing bicycle network via shared streets, which connects many diverse uses as well as multiple public transportation routes. The project will provide approximately 60 long-term bike storage inside the building and approximately 18 short-term bike parking outside of the building proximate to both the main entrance and retail entrances. The approximately 60 long-term bicycle spaces will be in a dedicate and secure bike storage room accessed from Revolution Drive, on which is located a dedicated bike lane. Additionally, the building shall contain 8 showers and changing facilities for its regular occupants.

LTC7 Reduced Parking Vehicles

The project is a providing a total of 177 parking spaces. This is more than 60% reduction from the LEED baseline for large office buildings which is based on the Institute of Transportation Engineers (ITE) Parking Generation Manual, 5th Edition.

LTC8 Green Vehicles

Per Somerville recommendations, the project will have 25% of the spaces or 45 parking spaces with Level 2 EV chargers. This quantity will exceed the minimum LEED requirement of 5% or 9 parking spaces. In addition, the building's design will include the ability to expand the quantity of EV parking space by 132 for a total of 177 spaces or 100% of the parking spaces being equipped with Level 2 EV chargers having time of use capabilities. This more than meets the LEED V4.1 requirements.

Sustainable Sites

SSP1 Construction Activity Pollution Prevention

A project-specific erosion and sedimentation control plan will be created and monitored with the objective of preventing loss of soil during construction, sedimentation of storm sewers, and pollution of the air with dust and particulate matter. The contractor shall be required to document compliance with the ESC throughout the construction process.

SSc1 Site Assessment

A site assessment including topography, hydrology, climate, vegetation, soils, human uses, and human health effects is being performed and will inform the design of the project as appropriate. The team will document findings via the Site Assessment Worksheet provided by USGBC.

SSc5 Heat Island Effect

The solar reflectance index on the light-colored and reflective low-sloped roofing, which will cover more than 75% of the overall building roof surface, will exceed an initial SRI of 82 and a 3-year SRI of 64. In addition, all dedicated building parking is located in a garage under the footprint of the building.
In addition, pedestrian-oriented site hardscape—as well as some parking areas—shall have high reflectivity values or will be shaded by vegetation. The weighted average of which will allow the project to earn the two points associated with this credit under Option 1.

SSC6 Light Pollution Reduction

Input power to all nonemergency interior light fixtures will be reduced by at least 50% between 11PM and 5AM (except for an allowable 30-minute override). Exterior lighting power densities will be below the ASSI/ASHRAE/IESNA Standard 90.1-2007 for Lighting Zone 4 (high-activity commercial districts in major metropolitan areas) considering allowable light trespass on the three sides of the site abutting public ways.

SSc Tenant Design and Construction Guidelines

Tenant design and construction guidelines will be issued to all building tenants to educate tenants about implementing sustainable design and construction features in their tenant improvement fit out. These guidelines will encourage building tenants to earn LEED ID+C v4 Certification for their interior fit-out.

Water Efficiency

WEp1/C1 Outdoor Water Use Reduction

Plant selection and an efficient irrigation system will reduce the potable water used for irrigation by at least 75% from a calculated midsummer baseline case as delineated under Option 2 for Reduced Irrigation. This will achieve 2 points under v4.1.

WEp2/C2 Indoor Water Use Reduction

Water-efficient plumbing fixtures will reduce domestic water use by at least 30% below the LEED water use baseline, shown through the usage-based calculations (Compliance Path 2).

- All toilets will utilize 1.1 gpf low flush valves
- All urinals will utilize 0.125 gpf ultra low flow flush valves
- All lavatories will utilize 0.35 gpm with metering tempering faucets
- All showers will utilize 1.0 gpm low flow shower heads

In addition, rainwater collection will be utilized for gray-water systems, further reducing the overall indoor water use. A Water use calculation will be performed to confirm a 40% reduction below baseline in indoor water use for 5 LEED points.

WEp3/c4 Building Level Water Metering & Water Metering

Permanent water meters will be installed which will measure the total potable water use for the building and its associated grounds. The client shall share data with USGBC as required. Permanent water meters will be installed to monitor water subsystems in the building in addition to the whole building potable water use. Examples of these subsystems include irrigation, indoor plumbing fixtures, domestic hot water, and reclaimed water, as applicable in the final design.

Energy Efficiency

EAp1/C1 Fundamental Commissioning & Enhanced Commissioning

A third-party Commissioning Agent (CxA) will be engaged before the end of the design development phase and will review and comment on the project Owner's Project Requirements (OPR), Basis of Design, draft Design Development & Construction Documents. Additionally, he/she will develop and implement a Commissioning Plan for the building HVAC, plumbing, lighting systems and envelope, review construction submittals, and then issue a summary Commissioning Report. Finally, the CxA will participate in training for the building operational staff. In addition to the Fundamental scope listed above, the CxA will verify the following for mechanical, electrical, plumbing, energy systems,
and building envelope; these tasks shall be included in the OPR and BOD:
- Review contractor submittals.
- Verify Inclusion of systems manuals and operator training requirements in the construction documents
- Verify systems manual updates and delivery
- Verify operator and occupant training delivery and effectiveness
- Verify seasonal testing
- Review building operations 10 months after substantial completion.

Develop an on-going commissioning plan. Currently, the project is planning to pursue Option 1, Path 1, and Option 2, but is not planning to pursue the Monitoring-Based commissioning point under Option 1, Path 2.

EAp2/c2 Minimum Energy Performance & Optimize Energy Performance

An energy model (calculated according to the building performance method described in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2013) will be developed to determine the energy performance. Based on other

projects in the neighborhood, and past project experience the MEP team and energy modeler estimated the preliminary savings to be about 17% which qualifies for 8 points with the potential energy savings of about 21% for a potential of 10 points.

EAp3 Building Level Energy Metering

Permanently installed meters will measure total building energy consumption. The client shall share data with USGBC as required. Tenant spaces will be capable of independently metering energy consumption for all systems dedicated to their space. The meters will meet all criteria required for core and shell projects.

EAp4/ C4 Fundamental Refrigerant management &Enhanced Refrigerant management

Building refrigerants will be selected to minimize ozone depletion and global climate change. Building refrigerants will not exceed maximum threshold allowances for contributions to ozone depletion and global warming potential. The core and shell project will likely not include all HVAC associated with anticipated work by the tenant; if the core/shell design team plans to include those systems to achieve the credit, we will provide appropriate supporting documentation from the tenant sales or lease agreement. It is anticipated that our systems will not exceed the credit threshold limits.

EAC7 Green Power & Carbon Offsets

The project will explore engaging in a contract to purchase an equivalent of 100% of the building's energy from green power, carbon offsets, or renewable energy certificates for a minimum of five years. The purchase amount, *if this credit is pursued*, shall be calculated from the building's total energy use as delineated in EAc2.

Materials and Resources

MRp1 Storage and Collection of Recyclables

A Recycling Staging Room at the building loading dock will support a building-wide recycling program for paper, corrugated cardboard, glass, plastic, and metal. A zone for the safe collection, storage, and disposal of batteries, mercury-containing lamps, and electronic waste will also be provided.

MRP2/C5 Construction Waste Management

A construction and demolition waste management plan will be developed prior to the start of construction which will identify logistics and the materials that must be tracked, the recycling facilities to which the waste will be diverted and the targeted recycling percentage. In pursuit of Option 1 of the credit, at least 75% of the construction and demolition debris and a minimum of four material streams will be diverted away from landfill and incineration facilities.

MRC1 Building Life-cycle Impact Reduction

The project will carry out a life cycle assessment and will also explore avenues to optimize concrete mix to reduce life cycle impact. Under the version 4.1 path, the project qualifies for at least 1 point with the potential of an additional 1 point for concrete mix design.

MRc2, 3, & 4 Building Product Disclosure and Optimization (BPDO): Environmental Product Declarations, Sourcing of Raw Materials, and Material Ingredients

The design team shall specify and provide guidance to contractors to enable them to track materials and products that satisfy these three MR credits during the design phase. Priority will be given to those items that comprise a high percentage of the project's overall material cost, and those that can demonstrate achievement across multiple credit requirements, including those associated with EQc2 for Low-Emitting Materials. The project will likely utilize the v4.1 credit updates for all three BPDO credits

Environmental Quality

EQp1 Minimum Indoor Air Quality Performance

Building HVAC systems will meet the minimum requirements of Sections 4 through 7 of ASHRAE Standard 62.1-2010 – Ventilation for Acceptable Indoor Air Quality, based on anticipated future tenant requirements

EQp2 Environmental Tobacco Smoke Control

Smoking will be prohibited inside the building and within 25 feet of the entire building perimeter.

EQc1 Enhanced IAQ Strategies

To promote a healthy indoor air quality, 10 feet long permanent entryway systems or appropriate roll-up mats will be installed at all regularly used building entrances; any room with hazardous gases or chemicals will be negatively pressured. MERV 13 or higher filters will be provided in all ventilation systems providing outdoor air to occupied spaces. The project is pursuing both Options 1 and 2.

EQc2 Low Emitting Materials

The design team shall specify and provide guidance to contractors to enable them to track materials and products that satisfy credit requirements. The project will utilize the v4.1 path for this credit.

EQc3 Indoor IAQ Management Plan

An indoor air quality plan during construction will require the builder to follow industry best-practices such as SMACNA IAQ Guidelines for Occupied Buildings Under Construction, protecting absorptive materials stored on site from moisture damage, and replacing air handling equipment media prior to occupancy.

EQC5 Quality Views

The design of the building envelope and floor plan will allow tenants to design their fit-out with a direct line of sight to the outdoors in at least 75% of all regularly occupied areas. The project shall develop a speculative tenant test fit to show compliance and determine the final percentage of space that meets requirements.

Innovation

The project will target at least 4 points available in this category by pursuing and combination of Innovation and Pilot Credits recognized by USGBC. The strategies listed below are currently being pursued:

Innovation: Green Building Education – Public education focusing on green building strategies and solutions will be provided by providing a self-guided tour of the building's spaces to bring attention to sustainable strategies as well as developing a case study of the building's LEED journey to inform occupants, visitors, and public of the building's sustainable attributes.

Innovation: Purchasing – Lamps – The base building lighting shall be selected to focus on low- or no mercury-containing lamps. A purchasing plan will be implemented for both indoor and outdoor fixtures.

Pilot: Design for Enhanced Resilience – The project team is integrating many of the strategies outlined in this Pilot credit, and is determining compliance with the requirements as written, with the intent to earn at least 1 point of the 2 available. The team intends to pursue the strategy in the interest of a more resilient building from both the owner's and tenant's perspectives. The project team is also reviewing Assessment and Planning for Resilience, and Passive Survivability and Back-up Power During Disruptions as additional potential strategies for inclusion.

Exemplary Quality Views – The design of the building envelope and floor plan will allow tenants to design their fit-out with a direct line of sight to the outdoors in at least 90% of all regularly occupied areas. The project shall

develop a speculative tenant test fit to show compliance and determine the final percentage of space that meets requirements.

Exemplary BPDO EPD

– The base building will use a minimum of 20 products from 5 different manufacturers that have Type III Product specific or Industry-wide Environmental Product Declaration (EPD). Under version 4.1 requirements, this qualifies for an exemplary credit.

IDC2 LEED Accredited Professional

The project team includes several LEED Accredited Professionals and will be able to document this credit without issue.

Regional Priority

The project currently anticipates potentially earning two of the four available points for the Regional Priority category:

- High Priority Site – The required threshold is two points; the project should be able to earn this credit through documenting the site either as a brownfield or as a DDA as described in the credit narrative above.
- Indoor Water Use Reduction – With the proposed fixtures capacity and gray-water systems, the project will likely achieve the minimum threshold for this regional credit.
- Optimize Energy Performance – The required threshold is eight points for earning 17% energy use reduction, and the project anticipates being able to achieve 8 points.

INTRODUCTION

This document outlines Development Review Application requirements in relation to the long-term environmental sustainability and climate resilience of buildings within Somerville. Development proposals that require Site Plan Approval by the Somerville Zoning Ordinance must include a completed Sustainable & Resilient Buildings Questionnaire (Questionnaire) with the required Development Review Application. A Development Review Application is considered incomplete unless a completed questionnaire is submitted with the application. It is strongly recommended that the development team meets with staff from the Office of Sustainability and Environment prior to submitting the Development Review Application.

The purpose of this Questionnaire is to minimize the adverse environmental impacts in the design, construction, and occupancy of buildings in Somerville and to ensure that the impacts of future climate conditions are carefully evaluated.

Please review the following documents before completing the Questionnaire:

- **Somerville Climate Change Vulnerability Assessment**
- **Carbon Neutrality Pathway Assessment**
- **Somerville Climate Forward**

PROCEDURE:

A completed Sustainable & Resilient Buildings Questionnaire must be submitted with a Development Review Application for all development proposals that require Site Plan Approval. New construction or alterations to existing structures of 25,000 square feet or more must also submit an updated Questionnaire prior to the issuance of the first Building Permit and prior to the issuance of the first Certificate of Occupancy to identify any design changes made subsequent to Site Plan Approval or additional information determined as the development process unfolds.

BACKGROUND: CARBON NEUTRALITY

Understanding the global imperative to reduce greenhouse gas emissions in order to prevent extreme changes to the climate, Mayor Joseph A. Curtatone set a goal for Somerville to become carbon neutral by the year 2050. Carbon neutrality is defined as the net-zero release of carbon dioxide and other greenhouse gases (GHG) within Somerville's municipal boundary. Reducing greenhouse gas emissions is critical to avoiding the worst impacts of climate change and to protecting the health, safety, and welfare of current and future generations. In 2017, the Somerville Board of Aldermen passed a resolution reaffirming the city's carbon neutrality goal. And In 2018, Somerville released its first community-wide climate action plan, Somerville Climate Forward.

To achieve carbon neutrality by 2050 and to minimize adverse environmental impacts, Somerville will need to drastically reduce greenhouse gas emissions from electricity, buildings, transportation, and waste disposal. To meet these goals, all buildings within the city will need to pursue net zero emissions. New development should

be designed to maximize envelope performance and energy efficiency, produce or procure renewable energy, and phase out fossil fuel use through electrification of building systems. The City of Somerville recognizes that as technology advances, incorporating design elements to mitigate carbon emissions and increase resilience may become more feasible. Applicants are asked to devise strategies that permit building systems to adapt and evolve over time to further reduce GHG emissions and to avoid path dependency that perpetuates reliance on fossil fuels.

BACKGROUND: CLIMATE CHANGE VULNERABILITY

Despite efforts to minimize greenhouse gas emissions, climate change is already impacting Somerville and changes to the climate will continue to intensify. The City of Somerville's Climate Change Vulnerability Assessment analyses vulnerabilities associated with Somerville's key climate stressors: increased precipitation, sea level rise and storm surge, and higher temperatures. The analysis recommends that new development consider these climate impacts and take appropriate measures to address the projected climatic conditions described in the assessment.

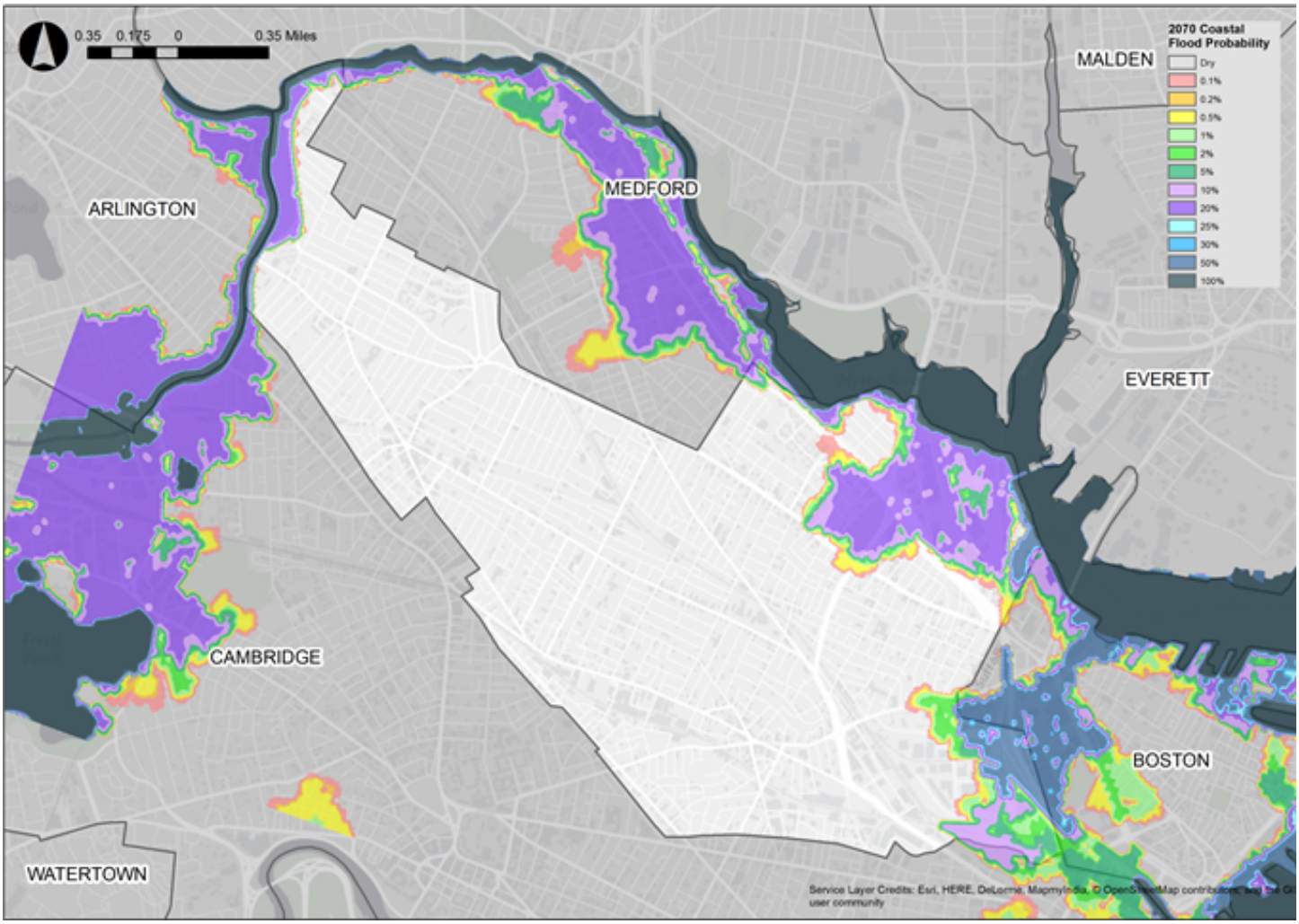
Several areas of Somerville are already prone to flooding from intense precipitation. With climate change, precipitation events will become more intense—meaning that a greater volume of rain will fall in a shorter period of time. Somerville is projected to experience more than a 30% increase in rainfall during a 100-year 24-hour event. This increase in precipitation will increase the risk of flooding in areas where the drainage system does not have sufficient capacity.

In addition to flooding from precipitation, sea level rise and storm surge are already potential concerns for areas of East Somerville and by 2035-2040 the Amelia Earhart Dam could be regularly flanked by storms, resulting in flooding for areas of Assembly Square, Ten Hills, and Winter Hill.

As the climate continues to change, average seasonal temperatures are also expected to increase and the number of days above 90 degrees Fahrenheit (historically about 10 a year) could rise to 40 days by 2030, a third of the summer, and 90 days by 2070, nearly the entire summer. In 2018 there were 23 days over 90 degrees.
As temperatures increase, Somerville will become more susceptible to the urban heat island effect which causes hotter temperatures due to paved surfaces and waste heat generated by energy use when compared to less developed areas. Increasing average temperatures can have wide-ranging impacts on human life, the built environment, and natural ecosystems. Rising temperatures and more intense heat waves present significant public health concerns and can contribute toward kidney, lung, and heart problems. Vulnerable populations are particularly susceptible to heat-induced illness and mortality. There will also be increasing demand for indoor cooling.

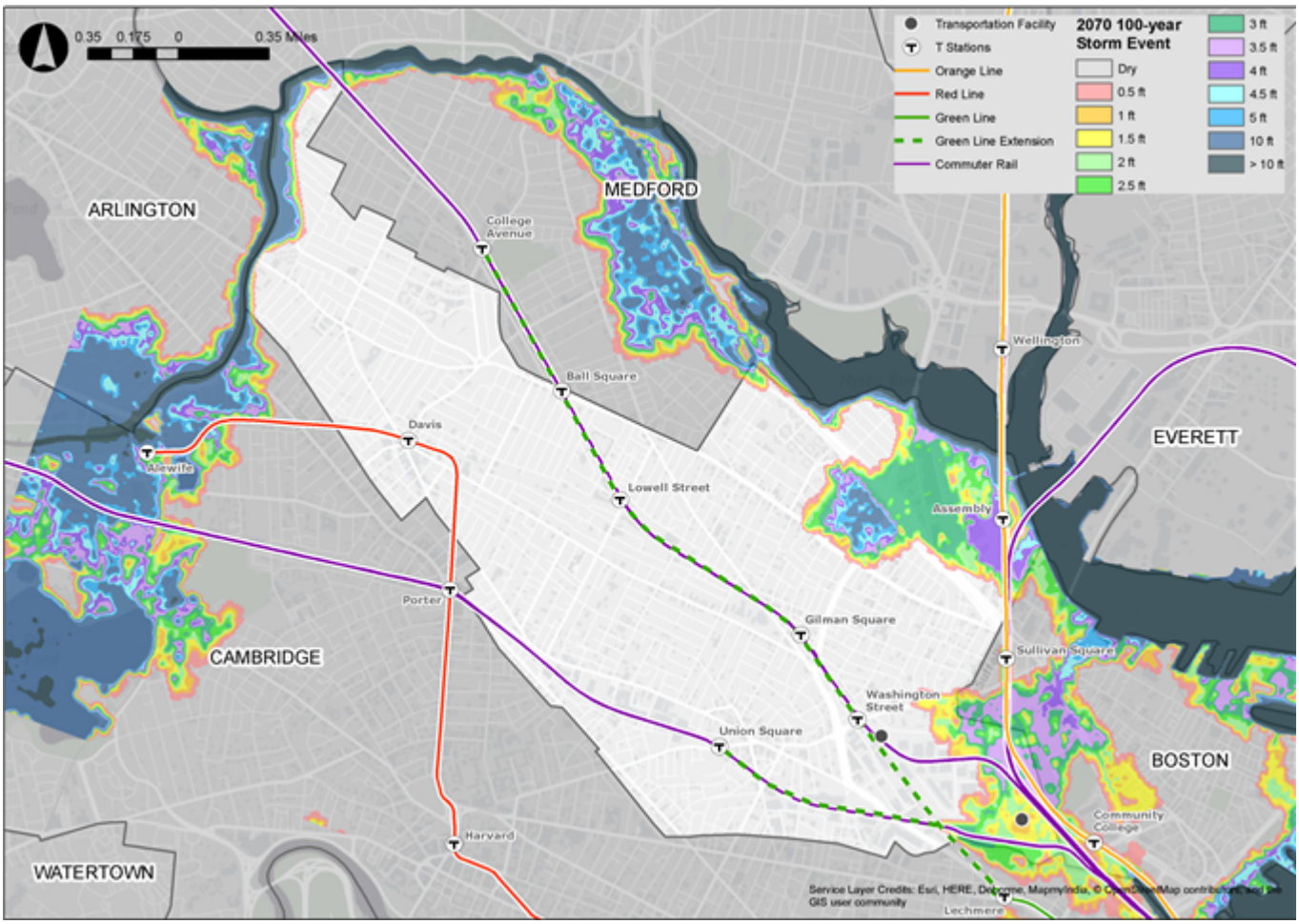
The following maps and figures provide an overview of projected climate exposure. Please review the Climate Change Vulnerability Assessment for more detailed analysis on Somerville's exposure, vulnerability, and risk to climate change. For higher resolution maps and GIS files, please contact Hannah Payne, Sustainability Coordinator, at hpayne@somervillema.gov.

2070 Coastal Flood Probability



This map shows the annual chance of flooding from coastal storm events and sea level rise in 2070. A 100% chance of flooding means that there is a nearly certain chance that the area will flood at least once in a given year, while a 50% chance means that there is an equal chance that it may or may not flood in a given year. A 1% chance of flooding corresponds with a 100-year event. A 0.1% chance corresponds with a 1000-year event. This map does not account for drainage (Somerville Climate Change Vulnerability Assessment, 2017)

2070 Coastal Flood Depth from 2070 100-year Storm Event

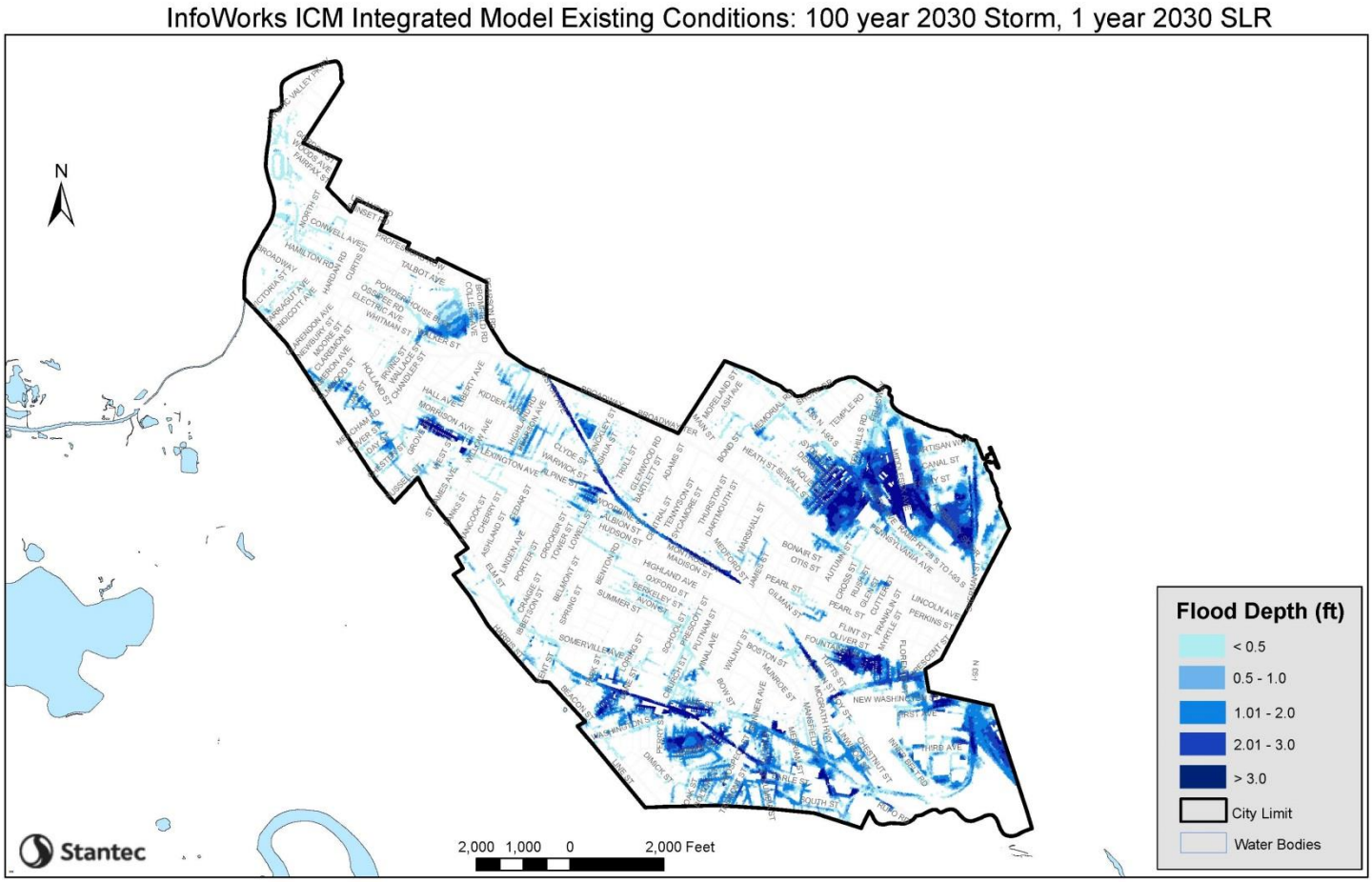


This map shows the projected flood depths of a 100-year coastal storm event in 2070 along with public transportation infrastructure assets. This map does not account for drainage (Somerville Climate Change Vulnerability Assessment, 2017)

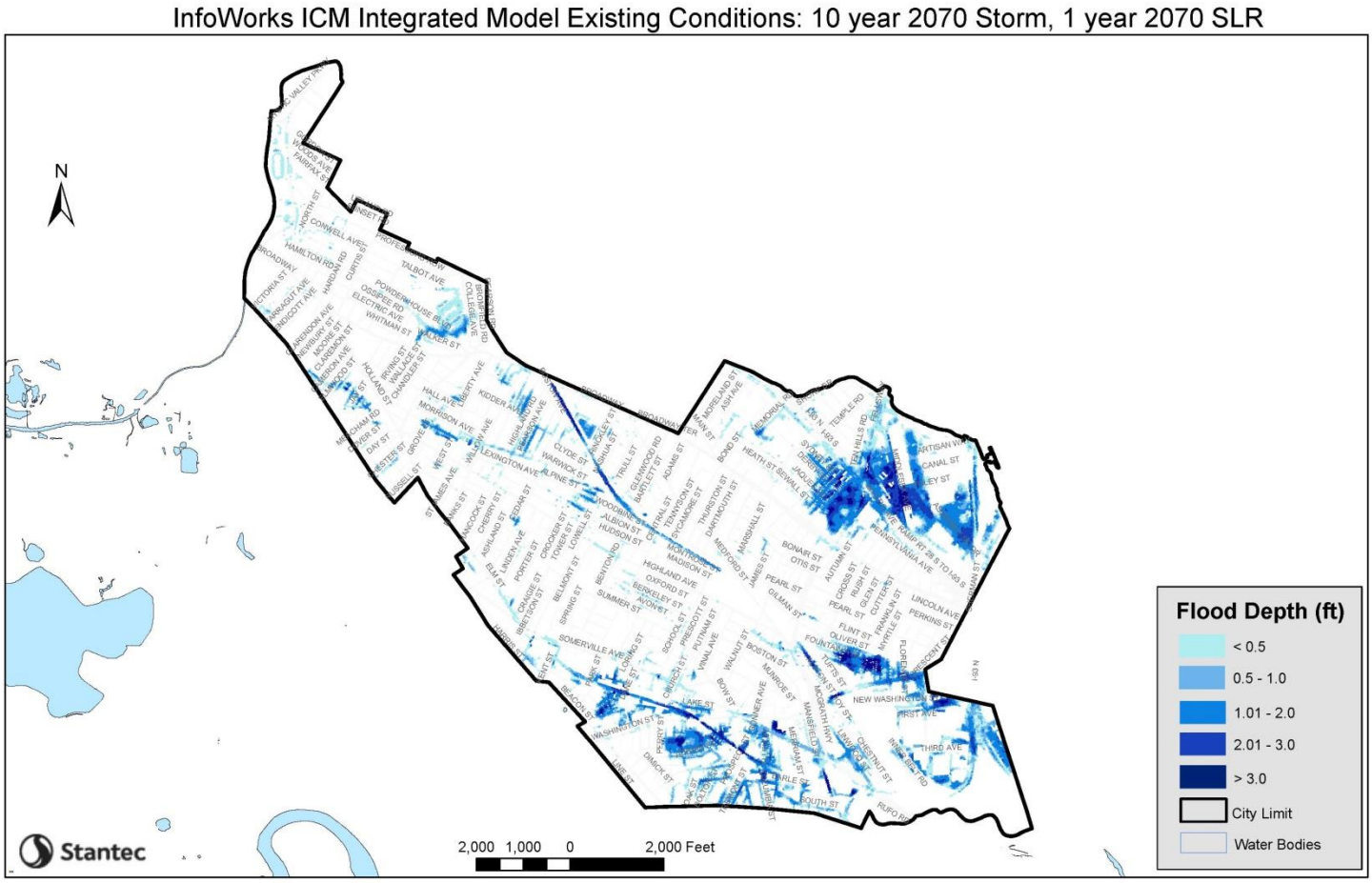
Precipitation Projections

Precipitation-based flooding is projected to increase in Somerville and is currently more of an immediate and widespread threat than sea level rise and storm surge. The intensification of both the frequency and intensity of rainfall events is likely to cause increased risk of flooding during rain events.

Storm Type	Present-day Rainfall	2030 Rainfall	2070 Rainfall
10-year (10% annual chance), 24-hour	4.9 in	5.6 in	6.4 in
100-year (1% annual chance), 24-hour	8.9 in	10.2 in	11.7 in

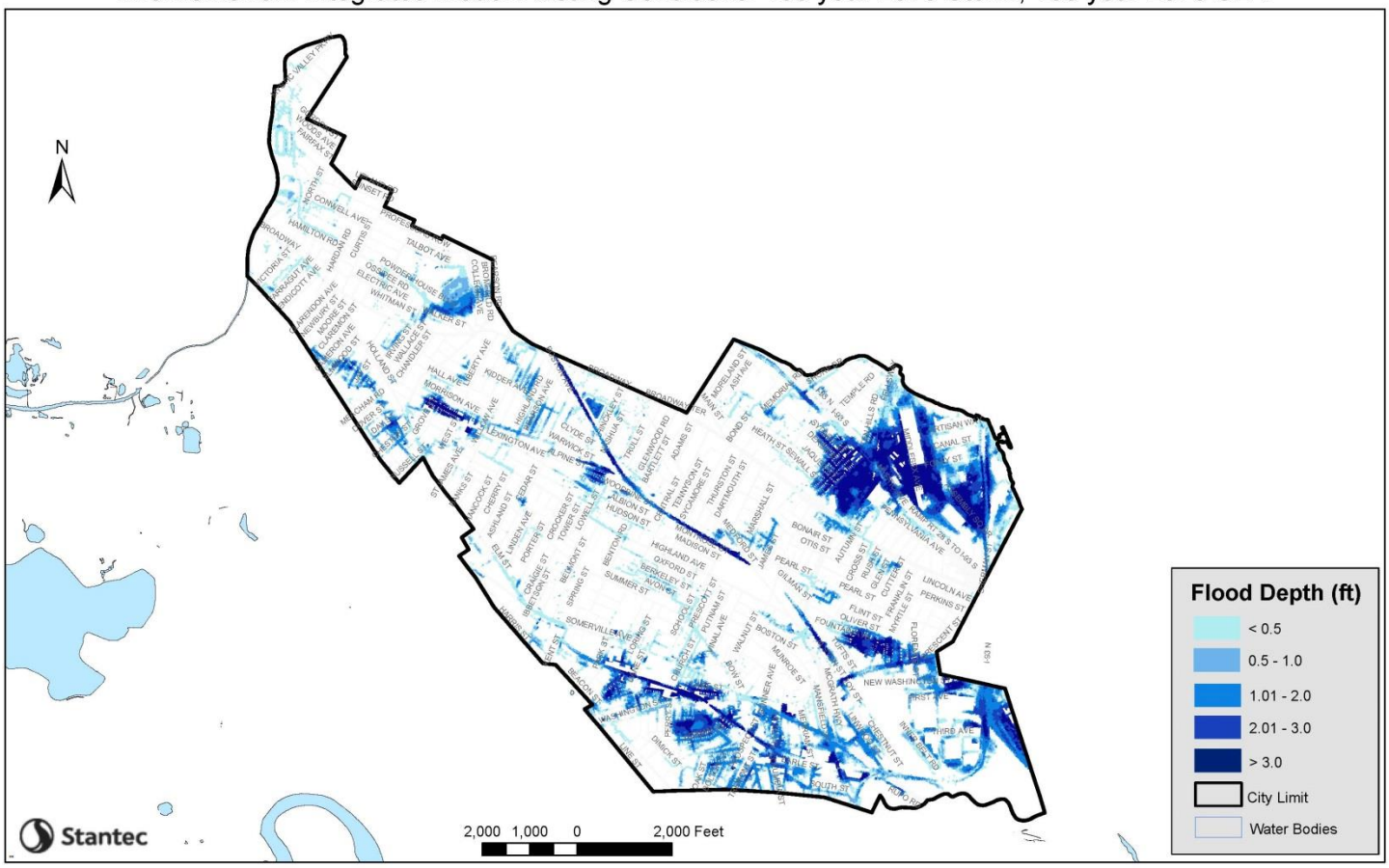


This map shows the impact of both precipitation-based flooding and sea level rise and storm surge. This map shows the modeled flood depths of a 100-year, 24-hour Design Storm with 1-year storm surge and sea level rise projections in 2030. Unlike the maps above, this includes modeling of the drainage system, which takes into account how water will be conveyed out of the city. The model is based on how the system is designed to function, so actual areas of flooding and depth of flooding could vary (Stantec, 2019).



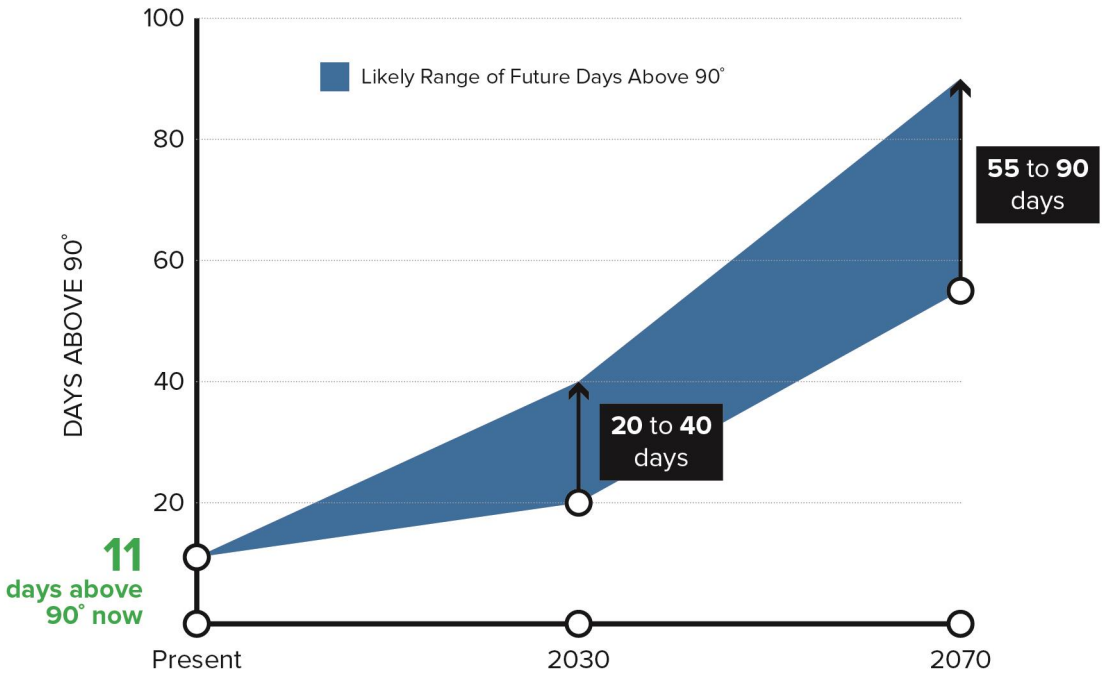
This map shows the impact of both precipitation-based flooding and sea level rise and storm surge. This map shows the modeled flood depths of the 10-year, 24-hour Design Storm with 1-year storm surge and sea level rise projections in 2070. This map includes modeling of the drainage system, which takes into account how water will be conveyed out of the city. The model is based on how the system is designed to function, so actual areas of flooding and depth of flooding could vary (Stantec, 2019).

InfoWorks ICM Integrated Model Existing Conditions: 100 year 2070 Storm, 100 year 2070 SLR



This map shows the impact of both precipitation-based flooding and sea level rise and storm surge. This map shows the modeled flood depths of 2070 100-year, 24-hour Design Storm with 100-year storm surge and sea level rise projections in 2070. This map includes modeling of the drainage system, which takes into account how water will be conveyed out of the city. The model is based on how the system is designed to function, so actual areas of flooding and depth of flooding could vary (Stantec, 2019).

Temperature Projections



(Somerville Climate Change Vulnerability Assessment 2017)

Temperature	1971-2000 (average)	2030 (low)	2030 Avg.	2030 (high)	2070 (low)	2070 Avg.	2070 (high)
Annual	50.0º F	53.3º F		53.5º F	55.8º F		58.7º F
Summer	70.6º F	74.5º F		74.8º F	77.4º F		80.6º F
Winter	29.8º F	32.2º F		33.0º F	34.6º F		38.0º F

RESOURCES:

For information on net-zero and resilient building and site design, please review the following resources:

- Passive House Principles
- Architecture 2030 Palette (Net-zero design tools)
- Building Resilience in Boston
- Enhancing Resilience in Boston
- A Better City's Resiliency Toolkit
- Ready to Respond: Strategies for Multifamily Building Resilience

For additional information visit www.somervillema.gov/sustainaville

SUSTAINABLE & RESILIENT BUILDINGS QUESTIONNAIRE

Section 1: Proposal Information

Proposal Name	Block 7A
Address	350 Assembly Row Sommerville MA
Developer	Federal Realty Investment Trust
Business Address	450 Artisan Way, Suite 320, Sommerville, MA 02145
Designated Contact	Sarah Forde
Telephone Number	617-440-5635
Contact's Email Address	sforde@federalrealty.com
Date Submitted	
Filing Type (Development review application, Building Permit, or CoA)	Development review application
Is this a revised Questionnaire?	No
Is MEPA Approval Required?	Yes/No; Why? Assembly Row Mixed Use Development EEA # 13989 received certificate on the Notice of Project Change on June 27, 2014

Section 2: Building & Site Details

2.1 Building Information

Building Uses	Block 7 A Retails, Lab/office
Gross Floor Area	379,767 sq.ft
Expected Life of Building	50 years
Expected Life of Building Systems: HVAC, electrical, boilers, plumbing, telecom, lighting, energy management.	15 to 20 years
Type of Heating System(s)	Hot Water Condensing Boiler plant
Type of Cooling System(s)	Central Water cooled chiller plant

2.2. Green Building

Green Building Professional(s): Name(s) and contact information	Jyothsna Giridhar, LEED AP BD+C Jacobs Consultants, Inc. 120 St. James Ave Boston, MA 02116 jyothsna.giridhar@jacobs.com / LEED AP BD+C

Professional Credentials: Green Building Program Certification(s)	LEED v4
Building LEED Rating	Gold
Building LEED Point Score	64
Will you pursue LEED certification through the USGBC?	Yes
Are any other green building certifications being pursued? (Passive House, Enterprise Green Communities, etc.). Please describe.	No

2.3. Electric Vehicle Parking

The number of electric vehicles (EVs) in Somerville is expected to increase significantly over the next decade with more electric vehicles coming to market than ever before. Conservative estimates based on historical trends alone suggest 20% of personal vehicles in Somerville will be electric by 2040. Installing capacity for EV supply equipment (EVSE) has been shown to be more feasible and cost effective during construction than when retrofitting parking areas to support the installation of EVSE in the future[1]. Providing EVSE can increase the property value, become a future revenue source, and provide an amenity that more tenants and commuters will be looking for. It is recommended that parking facilities be designed to allow for the most flexibility to adapt to future needs of electric vehicles and changing mobility needs. The City of Somerville recommends 25% of spaces have installed charging access and up to 100% of spaces be "EV Ready" (everything but the station installed). Eversource currently has a program to pay the associated infrastructure costs of EV charging, including infrastructure needed to be "EV ready." Please consult with Eversource to determine if any installation costs could be covered through their Make Ready Program.

Total # of Parking Spaces	177 parking spaces on 2 levels below grade (under building)
EVSE Plugs (number and voltage/ level of plugs)	45 parking spaces (25% of the total parking spaces) will be provided with electrical Level 2 (208V) charging stations
EV Ready Spaces (everything but station is installed)	132 parking spaces could be provided with Level 2 charging stations at a later date with the implementation of a demand load management.

[1] http://evchargingpros.com/wp-content/uploads/2017/04/City-of-SF-PEV-Infrastructure-Cost-Effectiveness-Report-2016.pdf; https://www.richmond.ca/__shared/assets/Residential_EV_Charging_Local_Government_Guide51732.pdf

Please share any other information on your EV strategy. Have you spoken with Eversource? Are you talking with EVSE providers? Have you considered EVSE needs in conjunction with your parking and mobility management plans?	The EV chargers will be Level 2 (208V) EV chargers with Time of Use capabilities.

2.4 Key Building Efficiency Metrics
The following should be provided for each building type (office, retail, multifamily, hotel, restaurant, etc.).

Vertical Envelope Performance

Vertical Envelope	ASHRAE Reference Building			Proposed Building		
	Percent of Vertical Area	**R value** *(see note 1)*	**U value** *(see note 2)*	**Percent of Vertical Area**	**R value** *(see note 1)*	**U value** *(note 2)*
Framed, insulated Wall	76%	R-13+R-10 c.i.	0.055 U-value	44%	R-13+R-12c.i	0.050 U-value
Opaque glass, curtain wall, shadowbox, spandrel	NA – ASHRAE reference building has no spandrel			22%	R-4	0.150 U-value
Vision glass	34%	2.38 R-value	0.42 U-value *(note 3)*	34%	3.33 R-value	0.30 U-value *(note 3)*
	100%		***0.157 Aggregate U*** *(note 4)*	***100%***		***0.157 Aggregate U*** *(note 4)*
			6.37 Aggregate R			***6.37 Aggregate R***

Notes:

1. Show in format of R+R c.i. where first R is amount of discontinuous insulation and second R is amount of continuous insulation.

2. U values shall be based on indicated R+R c.i. and shall conform to Appendix A of ASHRAE 90.1 2013.

3. U value includes frame, per NRFC standard methods.

4. Aggregate U is calculated as: $(U_1\%_1 + U_2\%_2 + U_3\%_3)$ where U is the respective thermal transmittance values and $\%_1$ is the percent area of framed insulated wall; $\%_2$ is the percent area of opaque glass, curtain, or shadowbox; and $\%_3$ is the percent area of vision glass. Only areas adjacent to conditioned

space are counted, areas adjacent to unconditioned spaces (e.g. parking garages, mechanical penthouses) are not counted. Aggregate R is the inverse of aggregate U. For percent areas for ASHRAE reference building, see Table G3.1.1-1 in ASHRAE 90.1 2013.

Other Performance Metrics

	ASHRAE Reference Building	Proposed Building
Air Infiltration (ACH 50)		
Aggregate Vertical Envelope R	6.37	6.37
Roof R	R-30 c.i.	R-30 c.i.
Lowest level conditioned floor above unconditioned space (if any) R	R-30	R-30
Cooling End Use (kBtu/sf-yr)	10.5	15.8
Heating End Use (kBtu/sf-yr)	98.8	32.0
Peak Heating (kBtu/hr-sf)	0.052	0.037
Peak Cooling (kBtu/hr-sf)	0.053	0.070
Site EUI (kBtu/hr-sf)	195	139

Section 3. Planning for Net Zero Emissions and Energy Resilience

3.1. How is the building currently designed to reduce energy usage? Please describe the key design features of the building including:

A) Building envelope performance (including roof, foundation, walls, and window assemblies)
B) How has the design team integrated energy performance into the building and site design and engineering (orientation, massing, mechanical systems, envelope, etc.)?
C) Efficiency of heating and cooling systems. Will these systems be electric? Provide reasoning for selection of heating and cooling systems.

The building enclosure has been designed to minimize thermal losses and solar gains while maintaining optimum conditions for building occupants. Roof construction includes high amounts of insulation and an outer membrane with high reflectivity. Windows consist of triple pane glass with a low solar heat gain coefficient and thermally broken aluminum framing. Window to wall ratio is also relatively low.

Mechanical systems are critical energy conservation components when it comes to research facilities. The systems proposed in the building are focused on reducing fossil fuel consumption and are designed to maintain the critical environments required in research facilities. Components designed to reduce fossil fuel are optimized runaround energy recovery, condensing boilers and air-to-water heat pumps. The primary heating for the building will be a 4-pipe modular air-to-water heat pump capable of simultaneous heating and cooling. The building will also have a gas-fired condensing boiler plant, sized for the full heating load, to operate as a backup and supplement the base load heat pump during peak heating demand. This combination of heat pumps and gas boilers constitutes hybrid electrification of space heating. The building design also includes a premium efficiency water cooled chiller plant.

3.2 Will the building be a net zero carbon building? A net zero carbon building is a highly energy efficient building that does not burn fossil fuels and either produces or procures enough carbon-free electricity to meet the building's total energy demand. If the building will not be a net zero carbon building, provide a technical description of how the building's systems will be transitioned over time to achieve net zero carbon emissions, including how and when systems can be transitioned in the future to carbon-free alternatives (provide timeline including 2030, 2040, and 2050 targets). Description must include whether any remaining emissions will be offset with on-site or off-site renewables and at what quantity. Changes could include, but are not limited to, addition of on-site renewable energy generation, energy storage, additional energy efficiency measures, building electrification, or other measures that would further reduce greenhouse gas emissions.

Being a research building it is not currently feasible to operate as a net zero carbon building. The building is being designed such that it will not burn fossil fuels above the heating design day referred to as hybrid electrification. Periods where the ambient temperature drops below the heating design day temperature the fossil fuel boilers pick-up the remaining heating load. This hybrid operation drastically reduces fossil fuel consumption than a facility without the air-to-water heat pump configuration.

Potential future options to eliminate fossil fuel boilers and implement full electrification include either an increase in air-to-water heat pump capacity (impractical) or a conversion to electric resistance hot water boilers. This will require additional electric infrastructure as the components are 'transitioned' over. Due to the building supporting research the roof has limited space for sufficient photo voltaic capacity to offset the electric demand of the site. Therefor the remaining electric demand would need to be procured from off-site renewable energy.

3.3 Describe any and all incentives, rebates, grants provided by utilities, government organizations, and other organizations being pursued to maximize building efficiency and to reduce emissions. Description must include any incentives that were considered but are not being pursued, including reasoning for each decision.

This project will pursue energy reduction incentives through the local electric and natural gas utility companies. A photo voltaic array has not been considered for this project but would be eligible for incentive.

3.4 Evaluate feasibility of on-site renewable generation. Please describe your analysis and findings. Analysis should consider incentives available. Will any renewable energy generation be incorporated into the project? If so, please describe (system type and capacity). If no, could it be added in the future? And will any off-site renewable energy be purchased?

Due to the equipment required for a research facility the roof will not have enough availability to allow for a sufficiently sized PV array.

3.5. Are any on-site energy storage systems planned? Please describe.

No.

3.6 Does the electric utility's infrastructure have enough capacity to support the addition of your building's energy load? Please provide confirmation from utility.

The current electrical utility infrastructure (3-2,500kVA transformers) is sized to support the current building design. The additional mechanical equipment required to transition to net zero (no on-site gas usage) would require additional electrical utility infrastructure beyond what is currently designed that is likely unfeasible for the project. The project would require (2) additional 2,500kVA transformers to support the demand and the utility standard does not allow more than 4 transformers in a vault which would trigger the need for an additional electrical vault.

3.7 Will the building's roof include any sustainability features? These may include, but are not limited to, high albedo roof materials, solar panels, or vegetation. Please describe what features could be added in the future (i.e. roof will be designed to support solar or green roof installation of X size).

The roof finish material will be made of a high albedo. Due to space limitations no other sustainability features will be on the roof.

Section 4: Climate Change Risk and Vulnerability

4.1 Climate Vulnerability Exposure
(check all that apply)

- ☐ X Sea Level Rise & Storm Surge
- ☐ X Precipitation Induced Flooding
- ☐ X Heat
- ☐ X Other(s): See 4.2 below

4.2 How is your site vulnerable to projected climate change impacts?

1. Coastal flooding influenced by the tidal portion of the Mystic River and Amelia Earhart dam
2. Riverine flooding influenced by the portion of mystic river above the Amelia Earhart dam
3. Local street ponding during rainfall events
4. The effects of sea level rise on each of the three prior flood hazards approach.

Refer to Figures (attached), which depict the location of the Project Site on the Integrated Flood Model Map Scenarios.

Increased storm frequency and intensity
Increased temperatures – heat island becomes bigger issue, hotter summers

The next two sections ask specific questions about how the project is designed to manage climate-related risks from heat, coastal and inland flooding.

Section 5: Managing Heat Risks

5.1 Describe all building features that will keep building occupants safe and comfortable during extreme heat, including mechanical systems and non-mechanical design elements to cool building (orientation, envelope, operable windows, etc.).

Envelope strategies:
The project is using triple glazing with a low SHGC and U value. These parameters contribute towards the thermal comfort of the occupants.
Mechanical strategies:
The base building air handlers are sized for ASHRAE 0.4% design day condition for Boston without utilizing the energy recovery system which would normally be in operation to pre-cool the outside air.

5.2 How has increased demand for indoor cooling been factored into the building design and energy management strategy?

The design team has taken measures to optimize the envelope and to push for tenants to reduce outside airflow (utilize fan coils in non-fume hood driven spaces) to lessen the impact of higher ambient temperatures on cooling capacity with the space.

5.3 List any indoor spaces without cooling and their uses.

Parking garage and stairwells.

5.4 What design features will be implemented on site to minimize the site's contribution to the urban heat island effect? Please describe any and all design elements. Strategies could include, but are not be limited to, the following:

- High albedo pavement or roof materials
- Passive cooling or increased ventilation capacity
- Green roofs or walls
- Heat resistant trees and plants
- Additional landscaped areas

- High albedo pavement and roofing materials
- Trees to shade hardscape

Section 6: Managing Flood Risks

6.1 Is the site susceptible to flooding from sea level rise and storm surge and/or rain events now or during the building's expected lifetime? Please refer to the Somerville Climate Change Vulnerability Assessment and the updated stormwater flooding maps provided in the Background section of this Questionnaire. Additional maps and data are available by request (email hpayne@somervillema.gov)

As per figure 15 of Somerville CCVA report, there is no immediate risk in 2030 due to sea level rise and storm surge, however per Figure 16 of CCVA, there is a 20% annual risk of flooding and sea level rise in 2070.

The existing site will be filled to achieve average ground-floor elevations to be above 13 feet (NGVD29).. This design elevation was established based on a flood analysis of the local area to which identifies the most significant risk to be the inundation of local stormwater infrastructure by future precipitation and sea level rise. The design mitigated the risk by setting the average elevation above 13 feet at which point the stormwater from the localized street flooding is expected to find relief overland through the roadways to the Mystic River as the highest crest elevations within the roadway is at elevation 12.6 feet. Furthermore, water levels above the Amelia Earhart are controlled by DCR which pumps prior to anticipated storms to provide greater flood storage upstream the dam.

If you answered YES to the previous question, please complete the remainder of Section 6. Otherwise, you have completed the Questionnaire. Thank you.

6.2 Flooding Design Considerations

**All Elevation refer to National Geodetic Vertical Datum of 1929

Proposed Site Elevation - Low	11.65(ft)	Proposed Site Elevation - High	14.04 (ft)
Lowest elevation of life-safety systems	13.8 (ft)	Proposed First Floor Elevation	12-14.04 (ft)
Nearest flood elevation for the 2070 10-year storm	11.8 ft	Nearest flood elevation for the 2070 100-year storm	12.8 ft

6.3 What are the first floor uses of the building? Are there any below ground stories of the building? If so, what uses are located below ground?

First floor uses include retail, building lobby and back of house spaces supporting lab/office and retail spaces. There are 2 levels below grade to accommodate the parking garage.

6.4 Are there any flood-sensitive assets, utilities, mechanical equipment, or life-safety systems located in areas of the building that are at risk of flooding? What measures will protect building systems during a flood or severe storm? These might include, but may not be limited to, the following:

- Elevation of utilities and mechanical systems
- Water tight utility conduits
- Waste water back flow prevention
- Storm water back flow prevention
- Systems located above the ground floor
- Securing objects at risk of becoming dislodged

All life safety equipment is raised to elevation 13.8 feet.
Utilities, equipment, or critical site infrastructure will be located above the 2070 DFE unless they are (1) specifically allowed below the 2070 DFE, and (2) designed, constructed, and installed to prevent floodwaters, including any backflow through the system, from entering or accumulating within the components.
Any utilities, equipment, or critical site infrastructure located below the 2070 DFE will be permitted in areas that are dry floodproofed in accordance with ASCE 24-14 Section 6.2

6.5. Residential and commercial buildings should be designed to maintain regular operations during a 10-year storm in 2070. **Describe how the site and building have been designed to maintain regular operations--**

meaning all systems will remain operational and all occupied spaces are protected from flooding--during the 2070 10-year storm. Please refer to both the 2070 coastal flood probability map and the 2070 10-year storm and 1-year sea level rise scenario (pages 3 and 6). Resilience measures might include, but may not be limited to, the following:

- Elevation of the site
- Structural elevation of the building
- Non-structural elevation of the ground floor
- Energy storage and backup generation
- Wet flood-proofing (allowing water to flow through building envelope)
- Dry flood-proofing (preventing water from entering building)

The building will be provided with life safety generator located on the roof and protected from flooding. The building will be provided with optional standby generator located on the roof and protected from flooding. Life safety equipment located on the first floor are elevated to elevation 13.8 feet.

1. Portions of site was designed to have been raised to an average elevation above 13 feet and will be dry floodproofed to 13.8 feet. Based on the 2070 10-year storm scenarios this will reach elevations of 11.8 feet which will not inhibit regular operations. At the appropriate time in the future the project will consider implementing temporary flood barriers, and dry floodproofed in accordance with ASCE 24-14 Section 6.2 as necessary.

6.6 Residential buildings should be designed to allow occupants to shelter in place during a catastrophic storm (100-year event) today and in the future, this means all life-safety systems should be above the 2070 100-year flood elevation. **How will your site and building be impacted by the 2070 100-year, 24-hour storm and how will your site and building be designed to protect against those impacts?** Please evaluate impact based on both the 2070 coastal flood depth model for the 100-year storm and the 2070 100-year, 100-year sea level rise model (pages 4 and 7). Summarize anticipated pre- and post-event policies, strategies, and actions necessary to facilitate post-flood recovery.

Not applicable

6.7 Will hazardous or toxic material be stored on site? Where will it be stored? How will you protect hazardous or toxic material from flooding?

As a lab office building there will be chemicals stored and used in the building with limits as prescribed in the building codes.

6.8 Will the site be accessible by a typical vehicle during a 10-year event (up to 6 inches of water) and by emergency vehicles (up to 12 inches of water) during a 100-year event?

Flooding will be expected in the southern corner of the site by 2070 based on the 10-year and 100-year event models, given the necessity to match proposed site elevations with relation to the existing adjacent Revolution Drive right-of way elevation. This would not impede access from typical vehicles in the 2070 10-year event or from typical emergency access to the site for 100-year event as access can be gained through Foley Street and Assembly Row and the site access drive within the site.,

InfoWorks ICM Integrated Model Existing Conditions: 100 year 2030 Storm, 1 year 2030 SLR

N

Approx. Location of Proposed Block 7A Building

Flood Depth (ft)

- < 0.5
- 0.5 - 1.0
- 1.01 - 2.0
- 2.01 - 3.0
- > 3.0
- City Limit
- Water Bodies

2,000 1,000 0 2,000 Feet

Stantec

InfoWorks ICM Integrated Model Existing Conditions: 10 year 2070 Storm, 1 year 2070 SLR

N

Approximate Project Site Area

Flood Depth (ft)

- < 0.5
- 0.5 - 1.0
- 1.01 - 2.0
- 2.01 - 3.0
- > 3.0
- City Limit
- Water Bodies

2,000 1,000 0 2,000 Feet

Stantec

InfoWorks ICM Integrated Model Existing Conditions: 100 year 2070 Storm, 100 year 2070 SLR

N

Approximate Project Site Area

Flood Depth (ft)

- < 0.5
- 0.5 - 1.0
- 1.01 - 2.0
- 2.01 - 3.0
- > 3.0
- City Limit
- Water Bodies

2,000 1,000 0 2,000 Feet

Stantec

PRE-SUBMITTAL LOAD ASSESSMENT

Reducing heating loads is the single-most important step towards designing a cost-effective zero-carbon building in Somerville
This calculator provides an easy way to assess and reduce your building's loads

Instructions:

1 Fill in the blue cells with your project information: All user inputs in blue are required.
2 Review Pre-Submittal Dashboard tab.
3 Compare the Proposed heating load to the heating load of a MA Code Minimum design, and to a Low Load design.
4 For more details, review the 'Detailed Loads' tab. It provides a summary of the assumptions in the MA Code and Low Load options.
5 Consider strategies to cost-effectively reduce the heating load and heating capacity of the Proposed design.

Project Name	FRIT Block 7a	
Project Address	350 Assembly Row, Somerville, MA 02145	
Submission date	2/10/2022	
Filing		
Individual responsible of submission		
Firm responsible for submission	Jacobs Consultants	
Project team		
Owner	Federal Realty Investment Trust	
Architect	Jacobs	
MEP Consultant	BR+A Consulting Engineers	
Energy Performance Consultant		*if applicable*
Envelope Consultant	Building Envelope Technology	*if applicable*
Summary of submission	The project is targeting LEED Gold.	*Outline key project goals, progress to date and major takeaways from this submission.*

General Project Inputs			User Comments	Instructions
Number of Stories Above Grade	8			Do not include mechanical penthouse or unconditioned rooftop amenity spaces as a story.
Total Building Gross Floor Area	379,769	GSF		Automatically calculated, based on sum of individual building types input below. Confirm that the value correctly aligns with the total building value.
Total Building Net Occupiable Floor Area		NSF		Automatically calculated, based on sum of individual building types input below.
Total Building Vertical Façade Area	151,168	SF		Automatically calculated, based on sum of individual building types input below.
Roof Area	50,338	SF		Include total roof area as seen from above. Includes mechanical penthouse roofs and spaces throughout the building where ambient air is located outside of the ceiling plane (even if not on top of building).

Primary Building Type			User Comments	Instructions
Primary Building Type	Office or Laboratory Building (>50,000 ft2)			Select from menu. Primary building type is the use type representing the greatest % of total building floor area. If the specific type of the Proposed building is not listed in the menu, select the type that is most similar. NOTE: if a single development includes multiple separate buildings, project teams are encouraged to use a separate CNBA calculator for each building. Otherwise, the daylight area and code-reference window area calculations will be incorrect. In such cases: the user must provide a separate a summary spreadsheet with total results summary tables and charts similarly formatted to this spreadsheet, including load, construction cost, and emissions summary, combining of all buildings in the development.
Gross Square Feet	361,845	GSF		Input gross square feet associated with the Primary Building Type. Do not include outdoor unconditioned areas or unconditioned garage spaces. If there are more than 3 building use types, input the total value that does not fall under Secondary and Tertiary categories below.
Vertical Façade Area	141,149	SF		Input total exterior facade area associated with the Primary Building Type, including exterior wall and window area, as defined by IECC 2018. Include only facade areas that separate interior conditioned/heated space from the exterior. Exclude other areas, such as: screen walls, parapets, mechanical louvers, and areas that separate non-conditioned space from the exterior. If there are more than 3 building use types, input the total value that does not fall under Secondary and Tertiary categories below.
Window Area (SF)	54,007	SF		Input window area associated with primary building. Calculated by measuring the rough opening of the window assembly. Spandrel area that does not allow light into the interior of the building is excluded. If there are more than 3 building use types, input the total value that does not fall under Secondary and Tertiary categories below.

Secondary Building Type			User Comments	Instructions
Secondary Building Type	Retail (stand alone)			Secondary building type is the use type representing the second greatest % of total building floor area.
Gross Square Feet	17,924	GSF		Provide inputs for the Secondary Building Type, similar to the process used for the Primary Building Type, defined above.
Vertical Façade Area	10,019	SF		Provide inputs for the Secondary Building Type, similar to the process used for the Primary Building Type, defined above.
Window Area (SF)	7,665	SF		Provide inputs for the Secondary Building Type, similar to the process used for the Primary Building Type, defined above.

Tertiary Building Type			User Comments	Instructions
Tertiary Building Type				Tertiary building type is the use type representing the third greatest % of total building floor area.
Gross Square Feet		GSF		Provide inputs for the Tertiary Building Type, similar to the process used for the Primary Building Type, defined above.
Vertical Façade Area		SF		Provide inputs for the Tertiary Building Type, similar to the process used for the Primary Building Type, defined above.
Window Area (SF)		SF		Provide inputs for the Tertiary Building Type, similar to the process used for the Primary Building Type, defined above.

Envelope Parameters			User Comments	Instructions
Window Assembly U-value	0.29	Btu/h-F-sf		U-value times Area (UxA) weighted average for all windows. [(U-value window type 1) x (Area window type 1) + (U-value window type 2) x (Area window type 2) ....] / [Total window area]
Wall Assembly U-value	0.060	Btu/h-F-sf		UxA weighted average for all walls. [(U-value wall type 1) x (Area wall type 1) + (U-value wall type 2) x (Area wall type 2) ....] / [Total wall area]. For assembly U-values see ASHRAE 90.1-2016 Normative Appendix A
Roof Assembly U-value	0.021	Btu/h-F-sf		UxA weighted average for all roofs. [(U-value roof type 1) x (Area roof type 1) + (U-value roof type 2) x (Area roof type 2) ....] / [Total roof area] For assembly U-values see ASHRAE 90.1-2016 Normative Appendix A
Infiltration - Maximum at Blower Door Test	0.25	cfm/sf at 75pa		IECC 2018 requires 0.25 cfm/sf @ 75 Pa

HVAC Parameters			User Comments	Instructions
Minimum Outdoor Airflow + Make-Up Rate	410,000	CFM		Input the minimum outdoor airflow rate required by ASHRAE 62.1 and/or ASHRAE 170 (licensed healthcare facilities), or minimum make-up airflow required. Make-up airflow is applicable to spaces with required minimum air-change rates (such as laboratories) or make-up is required due to a dedicated exhaust system (such as fume hoods, kitchen exhaust, etc.).
Proposed Outdoor Airflow + Make-Up Rate	410,000	CFM		Input the as-designed outdoor airflow quantity.
IF LAB OR HEATHCARE Class 3 and 4 Exhaust (CFM)	410,000	CFM		Class 3 and 4 Exhaust is defined as exhaust meeting the definition of Class 3 and 4 air in ASHRAE/ASHE Standard 62.1-2019, including laboratory fume hood exhaust, laboratory general exhaust when combined with laboratory fume hood exhaust, exhaust where energy recovery is not allowed by ASHRAE/ASHE Standard 170 for use in energy recovery systems with leakage potential, and systems exhausting toxic, flammable, paint or corrosive fumes or dust. The Class 3 and 4 Exhaust system must be capable of reducing exhaust and makeup airflow rates to 50% of the zone design values or the minimum required to maintain pressurization relationship requirements. Excludes Exempt Exhaust. Excludes Class 2 Exhaust. Exludes Class 1 Exhaust: for example, exludes office exhaust, even when the Proposed design has a combined office and laboratory exhaust system.
IF EXEMPT SPECIALTY EXHAUST OR COMMERCIAL KITCHENS INCLUDED Exempt Exhaust (CFM)	-	CFM		Exempt Exhaust is defined as exhaust where energy recovery systems are prohibited by 780 CMR or the International Mechanical Code. This includes exhaust from commercial kitchen hoods used for collecting and removing grease vapors and smoke. It also includes radioactive isotope exhaust. If exhaust heat recovery is included in the proposed design, the exhaust should not be classified as Exempt.
IF MECHANICALLY HUMIDIFIED Humidification Load	-	MBH		If the building, or a portion of the building is humidified, input the humidification load here. This value is carried consistently across all options.
IF APPLICABLE Process Heating Load	-	MBH		If the building heating plant supplies heating energy for process loads, input the total of all process loads supplied by the building heating system, such as: pool heating, sterilization, domestic hot water. Do NOT include process loads supplied by systems other than the building heating plant. This value is carried consistently across all options.
Ventilation Heating Sensible Recovery Effectiveness	60%	%		Sensible Energy Recovery Effectiveness is defined as the change in the dry-bulb temperature of the outdoor air supply achieved by the heat recovery device, divided by the difference between the outdoor air and entering exhaust air dry-bulb temperatures, at 0˚F winter design condition, expressed as a percentage. For buildings with multiple types of exhaust heat recovery, this value shall be the cfm-weighted average value.
Ventilation Cooling Total Enthalpy Recovery Effectiveness	10%	%		Enthalpy Energy Recovery Effectiveness is defined as the change in the enthalpy of the outdoor air supply achieved by the heat recovery device, divided by the difference between the outdoor air and entering exhaust air enthalpy, at summer design condition, expressed as a percentage. For buildings with multiple types of exhaust heat recovery, this value shall be the cfm-weighted average value.
Class 3 and 4 Exhaust Sensible Recovery Effectiveness	60%	%		Sensible Energy Recovery Effectiveness is defined above. For buildings with multiple types of exhaust heat recovery, this value shall be the cfm-weighted average value.
Electric Space Heating Plant Capacity	4,300	MBH	(20) 30-ton modules as BOD, (30) 30 ton modules as LEED Platinum alternate	Input the proposed capacity (useful heating output at design conditions) of the building's electric space heating system (heat pump for labs and healthcare; heat pump or electric resistance for all other building types). EXCLUDE the capacity of redundant equipment that is intended to operate only when heating equipment fails (commonly referred to as an N+1 configuration). Also EXCLUDE the capacity of redundant equipment that is intended to operate when ventilation heat recovery devices fail. This can be generated from preliminary calculations used to size the heating plant in the conceptual stages of design. EXCLUDE humidification and process heating loads (these are accounted for separately below).
Non-Electric Space Heating Plant Capacity	23,040	MBH	Heating load - 20,369 BTU/lb	Input the proposed capacity (useful heating output at design conditions) of the building's non-electric space heating system (e.g. fossil-fuel or district steam). EXCLUDE the capacity of redundant equipment that is intended to operate only when heating equipment fails (commonly referred to as an N+1 configuration). Also EXCLUDE the capacity of redundant equipment that is intended to operate when ventilation heat recovery devices fail. This can be generated from preliminary calculations used to size the heating plant in the conceptual stages of design. EXCLUDE humidification and process heating loads (these are accounted for separately below).
Total (Non-Redundant) Space Heating Plant Capacity	23,040	MBH		If the electric + non-electric heating system does not include redundancy, add rows 79 and 80. EXCLUDE the capacity of redundant equipment that is intended to operate only when other equipment fails (commonly referred to as an N+1 configuration). If there is redundancy between electric + non-electric heating systems, EXCLUDE redundant capacity. For example, if the non-electric heating plant is designed to handle the entire heating load, and the electric heating plant is redundant, then only enter the non-electric heating plant capacity. This can be generated from preliminary calculations used to size the heating plant in the conceptual stages of design.
Will the building's heating system be 100% electric?	No			This does not align with the City of Somerville's goals for carbon neutral ready buildings
Will the building's DHW be 100% electric?	No			This does not align with the City of Somerville's goals for carbon neutral ready buildings
Cooling Plant Capacity	3,000	Tons		Input the proposed cooling system capacity. This may include capacity for all uses such as: space cooling, dehumidification, process cooling loads, etc.

Envelope Outputs			User Comments	Instructions
Window-to-wall ratio	41%			Automatically calculated value. Review and confirm this aligns with the design intent. If inputs above are correct, this is the value following IECC 2018 protocol. Note: this is a simplified calculation and does not account for some envelope components, such as foundations and exposed floor areas.
Average Envelope U-value (UxA / A) - Design	0.121	Btu/h-F-sf		Automatically calculated value. Review and confirm this aligns with the design intent. If inputs above are correct, this is the value following IECC 2018 protocol. Note: this is a simplified calculation and does not account for some envelope components, such as foundations and exposed floor areas.
Average Envelope U-value (UxA / A) - Maximum per Code	0.127	Btu/h-F-sf		Automatically calculated value. If inputs above are correct, this is the approximate maximum allowable value following IECC 2018 protocol. Note: this is a simplified calculation and does not account for some envelope components, such as foundations and exposed floor areas.
Average Envelope U-value (UxA / A) - Aligns with Code?	Yes	Btu/h-F-sf		If "NO" is shown in red, the envelope likely does not comply with MA Energy Code (780 CMR revised 9th edition / IECC 2018, mandatory as of January 2021) and should be revised. Note: this is a simplified calculation and does not account for some envelope components, such as foundations and exposed floor areas. Therefore, it is not proof or equivalence of the envelope backstop code compliance.

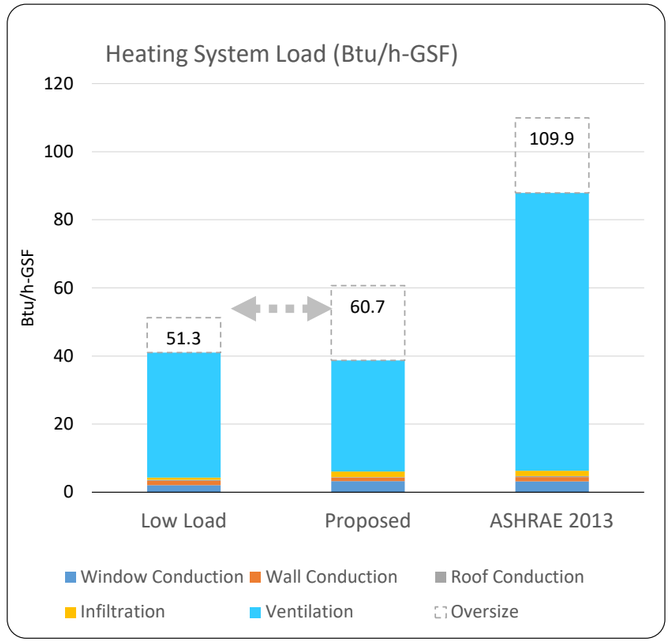
Heating Capacity			User Comments	Instructions
Low Load Building - Heating Plant Capacity	51.3	Btu/h-sf		Automatically calculated value. Indicates a Low-Load target value, intended to optimize cost-effective electrification and procurement of renewable energy to achieve Zero Net Carbon (ZNC).
Proposed Building - Heating Plant Capacity	60.7	Btu/h-sf		Automatically calculated value. Indicates the Proposed Design value, per the inputs above. Design teams should pursue low-load, cost-effective solutions to meet the City of Somerville's Climate Action goals.
MA Code Minimum Building - Heating Plant Capacity	109.9	Btu/h-sf		Automatically calculated value. Indicates the value for a building that meets the MA Code Minimum envelope and exhaust heat recovery performance.

PRE-SUBMITTAL DASHBOARD

*If the **Proposed Heating Load** is equal to or less than the **Low Load Target** AND the **Proposed design is all electric** , then **you are done!** If not, then complete the Development Review section.*

For labs and healthcare only:
*If the **Proposed Heating Load** is equal to or less than the **Low Load Target** AND the **Proposed Electric Heat Pump Heating Capacity** is equal to or greater than the **30F Ambient Suggested Minimum Heat Pump Heating Capacity** , then **you are done!** If not, then complete the Development Review section.*

HEATING SYSTEM PROPOSED TO USE FOSSIL FUELS
DHW SYSTEM PROPOSED TO USE FOSSIL FUELS



LOAD EVALUATION

	Low Load	Proposed	ASHRAE 2013
Window-to-Wall Ratio (%)	29%	41%	30%
Window Assembly U-Value (Btu/h-F-sf)	0.26	0.29	0.38
Opaque Wall U-Value (Btu/h-F-sf)	0.06	0.06	0.06
Infiltration (cfm/sf at 75pa)	0.10	0.25	0.25
Roof Assembly R-Value (Btu/h-F-sf)	0.03	0.02	0.03
Ventilation Sensible Recovery (%)	55%	60%	0%
Building Heating Load (Btu/h-GSF)	41	39	88
Primary System Oversize (%)	25%	57%	25%

HEATING CAPACITY TO BE ELECTRIFIED

	Low Load	Proposed	ASHRAE 2013
Heating Load (Btu/h-GSF) to be Electrified	41.0	38.7	87.9
		PASS	

LABS AND HEALTHCARE ONLY	Suggested Minimum (30F Ambient)*	Proposed	
Electric Heat Pump Heating Capacity (Btu/h-GSF)	22.1	11.3	
Electric Heat Pump Heating Capacity (MBH)	8,402	4,300	FAIL
Electric Heat Pump % of Total Proposed Heating Load	36%	19%	
Overall Pass/Fail for Labs and Healthcare (must pass both criteria)			FAIL

**The City of Somerville understands that it may not be practical to electrify 100% of the heating plant for high-ventilation facilities such as life sciences or healthcare buildings. Electrifying a portion of the heating plant equivalent to the load at 30 °F will reduce fossil fuel consumption by upwards of 90%. The addition of heat pumps to satisfy this load will largely decarbonize high-ventilation load facilities in operation while allowing for combustion-based fuel sources to address peak heating conditions.*